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SPECIFICATION FOR SUBTENSE BAR

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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SPECIFICATION FOR SUBTENSE BAR

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Indian Standard

SPECIFICATION FOR SUBTENSE BAR

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 28 July 1981, after the draft finalized by the Optical and Mathematical Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 Subtense bar is a surveying instrument used for distance measurement. It is used in conjunction with a theodolite having graticule with central cross markings. It can be used for measurement of distance up to 1 km, the accuracy obtainable being 1 : 1 000 at a distance of 200 m, if used with a theodolite of one second least count. At distances greater than 200 m, the accuracy falls as the square of the distance measured. It is light in weight and easy to carry. Subtense bar is fitted with a sight rule for proper setting with respect to the theodolite. It is mounted on a wooden stand while in use. Three circular discs are fixed on the bar at a spacing of 2 and 3 m as shown in Fig. 1 and the angle subtended at the theodolite position is observed to compute the distance between the theodolite and the stand of the subtense bar.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the requirements of subtense bar and its tripod.

2. MATERIAL

2.1 The material of subtense bar shall be as under:

a) Bar — steel tube conforming to IS : 3074-1965†.

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*Rules for rounding off numerical values (*revised*).

†Specification for steel tubes for automotive purposes.

b) Disc — steel sheet conforming to IS : 1079 - 1973*.

c) Sight rule — brass conforming to IS : 410 - 1977†.

d) Tripod legs — Sissoo, Aini or Teak wood.

e) Adaptor — brass conforming to IS : 292 - 1961‡.

2.2 The timber used for tripod shall be thoroughly seasoned, radially sawn and shall conform to the requirements of IS : 287 - 1973§. It shall be free from defects such as knots, cracks, shakes, insects decay, etc. The materials for the metallic portions shall be sound and conform to the requirements of the relevant Indian standard.

3. GENERAL REQUIREMENTS (*see* Fig. 1)

3.1 Bar and Discs

3.1.1 The steel tube used in subtense bar shall be in two pieces each 1·5 m long, hinged at the centre.

3.1.2 The hinge of subtense bar shall preferably be of rectangular section such that it fits in the corresponding adaptor of the stand smoothly and without undue play.

3.1.3 The tube shall be suitably slotted in order to reduce its weight without adversely affecting its strength.

3.1.4 The tube shall be straight without any bend or twist.

3.1.5 The three disc supports shall be properly positioned with such an accuracy that the distance between the centres of the discs when mounted shall be 2 m ± 1 mm or 3 m $\pm \frac{1}{2}$ mm at 20°C.

3.1.6 The arrangement for holding the discs on the bar shall be simple and convenient to operate.

3.1.7 The discs once clamped shall not get disturbed during use.

3.1.8 The discs shall be painted black on one side and white on the other, each with 75 mm white or black centre respectively. It shall also be painted with white or black strips as shown in Fig. 1.

3.1.9 The discs shall be provided in a suitable leather carrying case with a shoulder strap.

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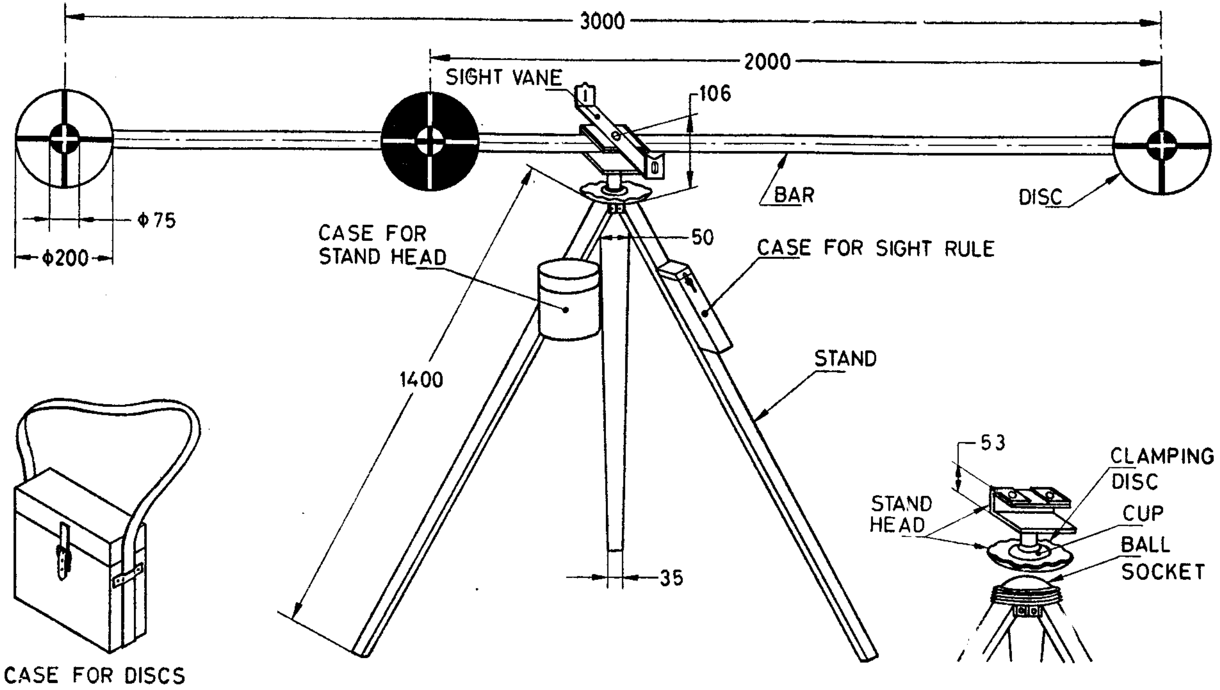
*Specification for hot rolled carbon steel sheet and strip (*third revision*).

†Specification for cold rolled brass sheet, strip and foil (*third revision*).

‡Specification for brass ingots and castings (*revised*).

§Recommendations for maximum permissible moisture content of timber used for different purposes (*second revision*).



All dimensions in millimetres.

FIG. 1 SUBTENSE BAR

3.1.10 The discs shall be kept separately in three different compartments of the leather case to avoid rubbing with each other which may otherwise spoil the painted surface.

3.1.11 The discs shall be suitably painted in accordance with the requirements of IS : 2933 - 1975*.

3.1.12 The adaptor on the stand shall have suitable arrangement for locking the subtense bar when mounted.

3.1.13 The subtense bar shall be fitted with a bubble for levelling.

3.2 Tripod

3.2.1 The tripod shall have a ball and socket arrangement in the adaptor meant for holding the subtense bar. It shall be convenient to operate and shall have locking arrangement.

3.2.2 The head of the tripod shall also have suitable arrangement for holding the sight rule exactly at 90° to the subtense bar.

3.2.3 The tripod shall have suitable pouch for holding the sight rule when not in use.

3.2.4 Pouch shall be of leather with suitable arrangement for closing the lid securely.

3.2.5 The section of the legs of tripod shall be such that when closed it will form a circular cross-section.

3.2.6 The recommended dimensions of stand are as given in Fig. 1.

3.2.7 The legs of the tripod shall be suitably tapered from top to bottom.

3.2.8 The spikes of the stand shall be suitably hardened and tempered.

3.2.9 The leather used for the pouch for sight rule and the disc shall be treated against the insects and moth attack.

3.2.10 A strap shall be provided on the stand to keep the legs closed when not in use.

3.2.11 The stand head shall be detachable so as to be kept in the leather case provided on the tripod when not in use.

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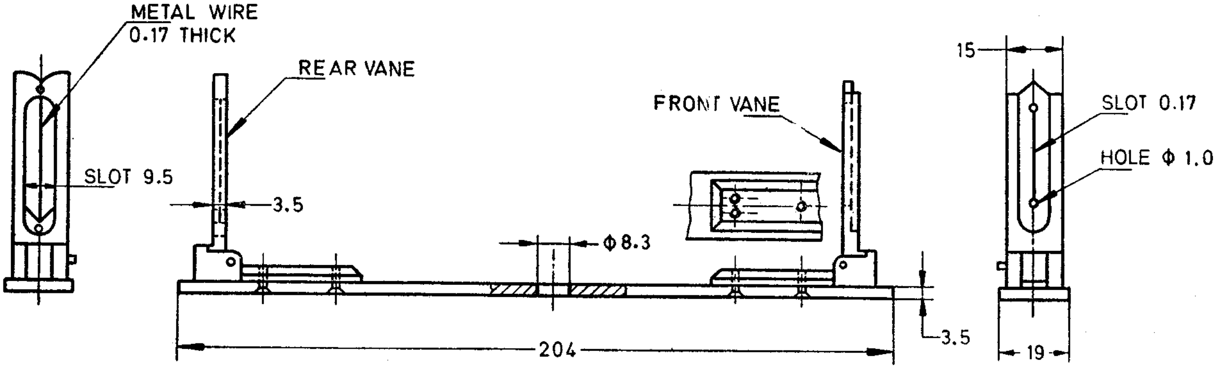
*Specification for enamel, exterior (a) undercoating, (b) finishing (*first revision*).



All dimensions in millimetres.

FIG. 2 SIGHT VANE

4. DIMENSIONAL AND CONSTRUCTIONAL REQUIREMENTS (*see* Fig. 1)

4.1 The diameter and thickness of the tube for subtense bar shall be 25 ± 2 mm and 1 ± 0·1 mm respectively.

4.2 The weight of the subtense bar shall preferably be less than 4 kg.

4.3 The sensitivity of the bubble shall be 10 ± 2 minutes for 2 mm run of the air bell. The diameter and length of the bubble shall preferably be 5 ± 1 mm and 25 ± 1 mm respectively. The bubble shall meet the requirements of IS : 1632 - 1960*.

4.4 The diameter and thickness of the disc shall be 200 ± 2 mm and 1·70 ± 0·15 mm respectively. It shall be painted with white and black strips as shown in Fig.1.

4.5 The fitment arrangement of the discs on the subtense bar shall be such that when the distance between the discs is 3 m, both discs shall have white background with black centre. When the distance is 2 m, one disc shall have white background with black centre and the other black background with white centre.

5. FUNCTIONAL REQUIREMENTS

5.1 When the sight vane is aligned with theodolite kept at a distance of 200 m the subtense bar shall be at 90° to the line of sight.

5.2 It shall be convenient to rotate the adaptor in any position all around 360° by ball and socket joint and once clamped the subtense bar shall not move from its position.

5.3 The sight vane shall generally conform to the dimensions and design shown in Fig. 2.

NOTE — Fig. 2 is only for guidance and is not intended to restrict the actual design.

5.4 The tripod shall be stable against strong winds.

5.5 The legs of the stand shall open smoothly when in use.

5.6 The hinge of the subtense bar shall be of such design that when closed the two arms of the subtense bar shall fold side by side and when opened the two shall form one straight long bar with one common axis.

5.7 The inner pouches in the carrying case for discs shall be so designed that the painted surfaces of the discs do not rub each other and do not get damaged in any other way.

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*Specification for bubbles.

6. TEST

6.1 The distance between 2 m and 3 m spaced discs shall be measured by a 5 m steel tape having accuracy conforming to IS : 1270 - 1965*. It shall measure 2 m ± 1 mm for 2 m distance and 3 m ± $\frac{1}{2}$ mm for 3 m distance at 20°C. The tolerance for perpendicularity of the sight rule and the subtense bar shall be ± 1° of arc. It may be checked by a suitable gauge.

7. FINISH

7.1 All brass components except bearing faces shall be bronzed black. The stand shall be varnished. The subtense bar shall be painted black after proper rust-proof treatment.

8. MARKING

8.1 The subtense bar shall be marked at a suitable place with the manufacturer's name or trade-mark and the year of manufacture.

8.1.1 The subtense bar may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors may be obtained from the Indian Standards Institution.

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*Specification for metric steel tape measures (winding) type (*revised*).

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2